# TFT LCD Tentative Specification

# MODEL NO.: V420H1 – LE1

Customer: _____

Approved by: _____

Note:

| | |
|---|---|
| Approved By | TV Head Division |
| | LY Chen |

| | | |
|---|---|---|
| Reviewed By | QA Dept. | Product Development Div. |
| | Hsin-nan Chen | WT Lin |

| | | |
|---|---|---|
| Prepared By | LCD TV Marketing and Product Management Div. | |
| | CY Chang | CY Sung |

# - CONTENTS -

## REVISION HISTORY

| Version | Date | Page (New) | Section | Description |
|---|---|---|---|---|
| Ver 0.0 | June 25,09' | All | All | Tentative Specification was first issued. |

# 1. GENERAL DESCRIPTION

## 1.1 OVERVIEW

V420 H1- LE1 is a 42" TFT Liquid Crystal Display module with 6pcs LED Light Bar Backlight and 2ch-LVDS interface. This module supports 1920 x 1080 Full HDTV format and can display 1.07G colors ( 8-bit +FRC). The converter module for backlight is built-in.

## 1.2 FEATURES

-High brightness (450 nits)
- Ultra-high contrast ratio (4000:1)
- Faster response time (gray to gray average 4ms)
- High color saturation NTSC 72%
- Ultra wide viewing angle : 176(H)/176(V) (CR≥20) with Super MVA technology
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- 180 degree rotation display (option)
- Color reproduction (nature color)
- Low color shift function

## 1.3 APPLICATION

- TFT LCD TVs
- Multi-Media Display

## 1.4 GENERAL SPECIFICATI0NS

| Item | Specification | Unit | Note |
|---|---|---|---|
| Active Area | 930.24 (H) x 523.26 (V) (42" diagonal) | mm | (1) |
| Bezel Opening Area | 937.24 (H) x 530.26 (V) | mm | |
| Driver Element | a-si TFT active matrix | - | |
| Pixel Number | 1920 x R.G.B. x 1080 | pixel | |
| Pixel Pitch (Sub Pixel) | 0.1615 (H) x 0.4845 (V) | mm | |
| Pixel Arrangement | RGB vertical stripe | - | |
| Display Colors | 1.07G | color | |
| Display Operation Mode | Transmissive mode / Normally Black | - | |
| Surface Treatment | Anti-Glare Coating (Haze 11%)<br>Hard Coating (3H) | - | |

## 1.5 MECHANICAL SPECIFICATIONS

| Item | | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Module Size | Horizontal(H) | - | 983 | - | mm | (1) |
| | Vertical(V) | - | 576 | - | mm | (1) |
| | Depth(D) | 11 | 12 | 13 | mm | |
| | Depth(D) | | TBD | | mm | To converter cover |
| Weight | | | TBD | | | |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Storage Temperature | $T_{ST}$ | -20 | +60 | ºC | (1) |
| Operating Ambient Temperature | $T_{OP}$ | 0 | +50 | ºC | (1), (2) |
| Shock (Non-Operating) | $S_{NOP}$ | - | 50 | G | (3), (5) |
| Vibration (Non-Operating) | $V_{NOP}$ | - | 1.0 | G | (4), (5) |

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

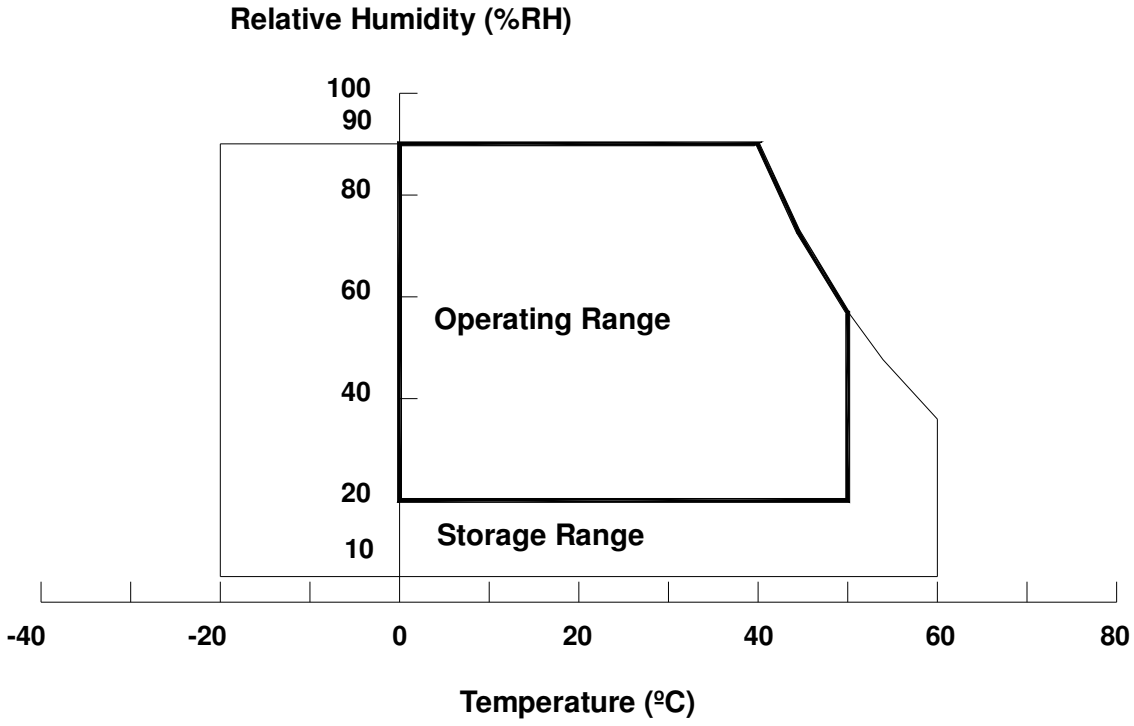
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 200 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



### 2.2 Package storage

When storing modules as spares for a long time, the following precaution is necessary.

(a) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35℃at normal humidity without condensation.

(b)The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

### 2.3 ELECTRICAL ABSOLUTE RATINGS

#### 2.3.1 TFT LCD MODULE

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power Supply Voltage | Vcc | -0.3 | 13.5 | V | |
| Input Signal Voltage | $V_{IN}$ | -0.3 | 3.6 | V | |

#### 2.3.2 BACKLIGHT UNIT

| Item | Symbol | Test Condition | Min. | Type | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Light Bar Voltage | $V_W$ | Ta = 25 ℃ | - | - | 60 | $V_{RMS}$ | |
| Converter Input Voltage | $V_{BL}$ | - | 0 | - | 30 | V | |
| Control Signal Level | - | - | -0.3 | - | 7 | V | |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

Note (2) No moisture condensation or freezing.

Note (3) The control signals includes Backlight On/Off Control, I_PWM Control, E_PWM Control and STATUS signal for converter status output.

## 3. ELECTRICAL CHARACTERISTICS

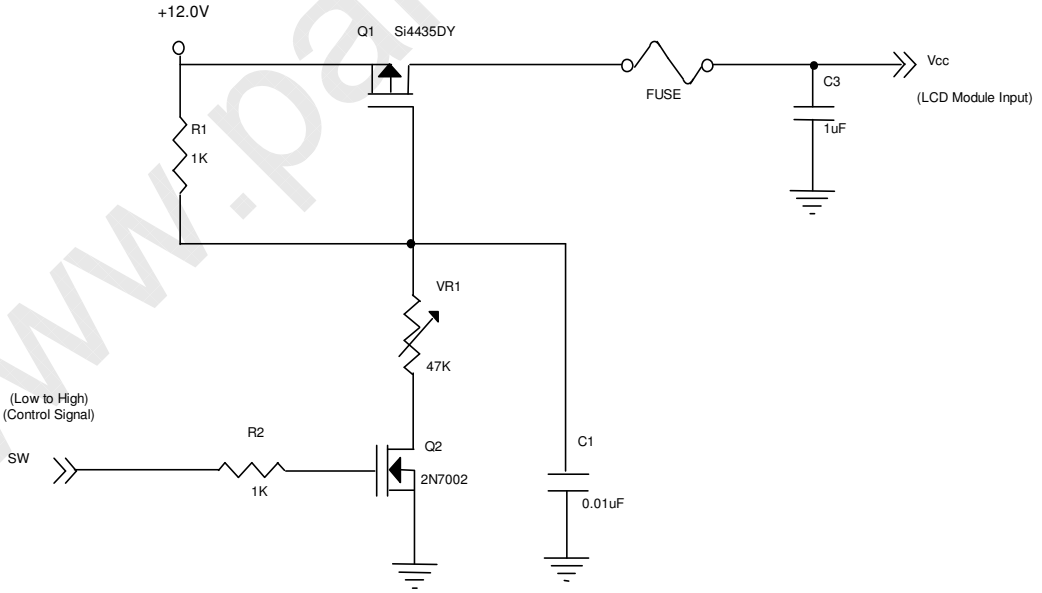
### 3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

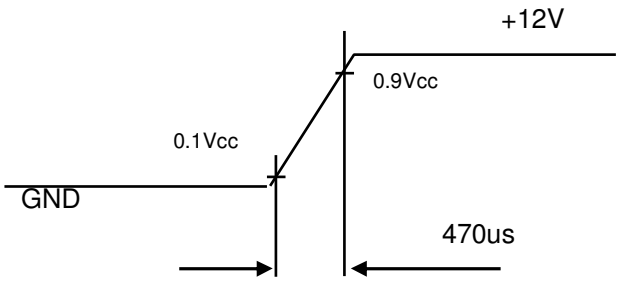
| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | VCC | 10.8 | 12 | 13.2 | V | (1) |
| Power Supply Ripple Voltage | | VRP | - | - | 350 | mV | |
| Rush Current | | IRUSH | - | - | 3.6 | A | (2) |
| Power Supply Current | White Pattern | - | - | - | 1.65 | 2.13 | A | (3) |
| | Vertical Stripe | - | - | 1 | - | A | |
| | Black Pattern | - | - | 1.6 | - | A | |
| LVDS interface | Common Input Voltage | VLVC | 1.125 | 1.25 | 1.375 | V | |
| | Terminating Resistor | RT | - | 100 | - | ohm | |
| CMOS interface | Input High Threshold Voltage | VIH | 2.7 | - | 3.3 | V | |
| | Input Low Threshold Voltage | VIL | 0 | - | 0.7 | V | |

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:

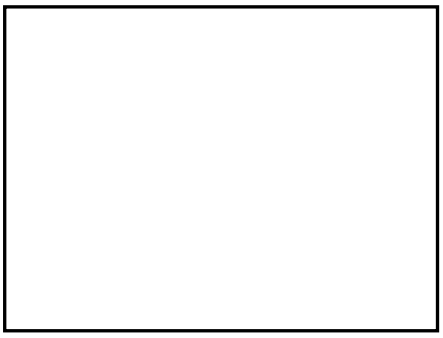


**Vcc rising time is 470us**




Note (3) The specified power supply current is under the conditions at Vcc =12V, Ta = 25 ± 2 ºC, $f_v$ = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

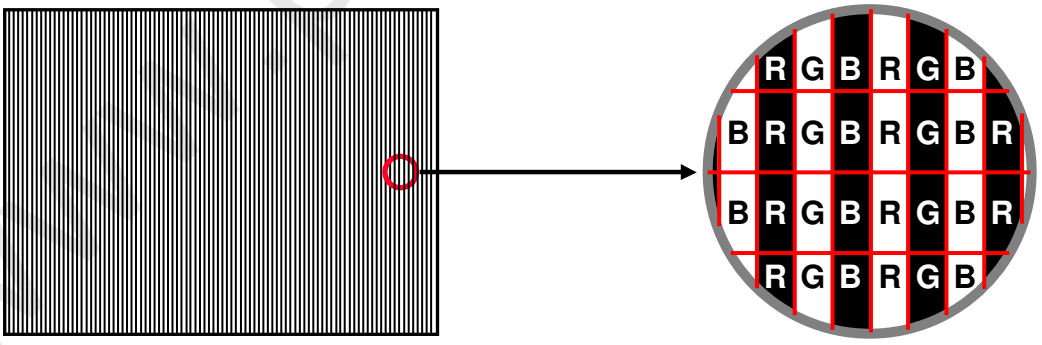


Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern




Active Area

## 3.2 BACKLIGHT CONVERTER UNIT

### 3.2.1 LED LIGHT BARCHARACTERISTICS (Ta = 25 ± 2 ºC)

| Parameter | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Light Bar Voltage | $V_W$ | - | 41.6 | - | $V_{RMS}$ | $I_L$ =60 mA |
| LED Forward Voltage | $V_f$ | 3.0 | 3.2 | 3.4 | $V_{RMS}$ | $I_L$ =60mA |
| LED Current | $I_L$ | TBD | 60 | TBD | mA | |

### 3.2.2 CONVERTER CHARACTERISTICS (Ta = 25 ± 2 ºC)

| Parameter | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Power Consumption | $P_{BL}$ | - | TBD | - | W | |
| Converter Input Voltage | $V_{BL}$ | 22.8 | 24 | 25.2 | $V_{DC}$ | |
| Converter Input Current | $I_{BL}$ | - | TBD | - | A | |
| Oscillating Frequency | $F_W$ | | TBD | | kHz | |
| Dimming Frequency | $F_B$ | | 160 | | Hz | |
| Minimum Duty Ratio | $D_{MIN}$ | - | 5 | - | % | |

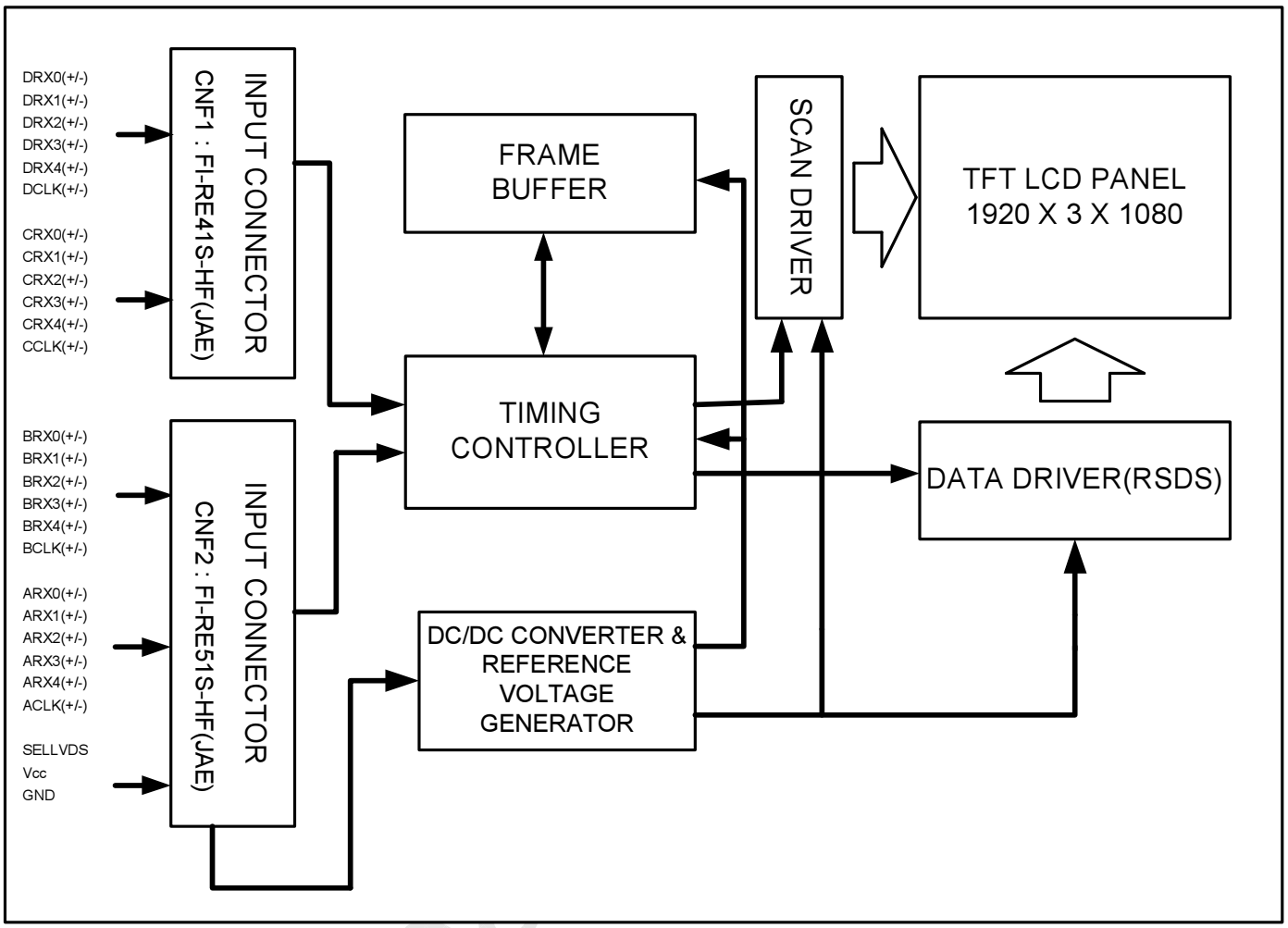
### 3.2.3 CONVERTER INTERFACE CHARACTERISTICS

External dimming: 150Hz~170Hz, duty ratio: 5%~100%

| Item | | Symbol | Test Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| On/Off Control Voltage | ON | $V_{BLON}$ | - | 2.0 | - | 5.0 | V | |
| | OFF | | - | 0 | - | 0.8 | V | |
| External PWM Control | HI | $V_{EPWM}$ | VSEL=H | 2.0 | - | 5.0 | V | ON Duration |
| | LO | | VSEL=H | 0 | - | 0.8 | V | OFF Duration |

## 4. BLOCK DIAGRAM

### 4.1 TFT LCD MODULE



## 5. INTERFACE PIN CONNECTION

### 5.1 TFT LCD MODULE

CNF1 Connector Pin Assignment (FI-RE51S-HF(JAE) or equivalent)

| Pin | Name | Description | Note |
|---|---|---|---|
| 1 | GND | Ground | |
| 2 | N.C. | No Connection | (1) |
| 3 | N.C. | No Connection | |
| 4 | N.C. | No Connection | |
| 5 | N.C. | No Connection | |
| 6 | N.C. | No Connection | |
| 7 | N.C. | No Connection | |
| 8 | N.C. | No Connection | |
| 9 | GND | Ground | |
| 10 | CH3_0N | Third Pixel Negative LVDS differential data input. Channel 0 | (4) |
| 11 | CH3_0P | Third Pixel Positive LVDS differential data input. Channel 0 | |
| 12 | CH3_1N | Third Pixel Negative LVDS differential data input. Channel 1 | |
| 13 | CH3_1P | Third Pixel Positive LVDS differential data input. Channel 1 | |
| 14 | CH3_2N | Third Pixel Negative LVDS differential data input. Channel 2 | |
| 15 | CH3_2P | Third Pixel Positive LVDS differential data input. Channel 2 | |
| 16 | GND | Ground | |
| 17 | CH3_CLKN | Third Pixel Negative LVDS differential clock input. | |
| 18 | CH3_CLKP | Third Pixel Positive LVDS differential clock input. | |
| 19 | GND | Ground | |
| 20 | CH3_3N | Third Pixel Negative LVDS differential data input. Channel 3 | (4) |
| 21 | CH3_3P | Third Pixel Positive LVDS differential data input. Channel 3 | |
| 22 | CH3_4N | Third Pixel Negative LVDS differential data input. Channel 4 | |
| 23 | CH3_4P | Third Pixel Positive LVDS differential data input. Channel 4 | |
| 24 | N.C. | No Connection | (1) |
| 25 | N.C. | No Connection | |
| 26 | CH4_0N | Fourth Pixel Negative LVDS differential data input. Channel 0 | (4) |
| 27 | CH4_0P | Fourth Pixel Positive LVDS differential data input. Channel 0 | |
| 28 | CH4_1N | Fourth Pixel Negative LVDS differential data input. Channel 1 | |
| 29 | CH4_1P | Fourth Pixel Positive LVDS differential data input. Channel 1 | |
| 30 | CH4_2N | Fourth Pixel Negative LVDS differential data input. Channel 2 | |
| 31 | CH4_2P | Fourth Pixel Positive LVDS differential data input. Channel 2 | |
| 32 | GND | Ground | |
| 33 | CH4_CLKN | Fourth Pixel Negative LVDS differential clock input. | |
| 34 | CH4_CLKP | Fourth Pixel Positive LVDS differential clock input. | |
| 35 | GND | Ground | (4) |
| 36 | CH4_3N | Fourth Pixel Negative LVDS differential data input. Channel 3 | |
| 37 | CH4_3P | Fourth Pixel Positive LVDS differential data input. Channel 3 | |
| 38 | CH4_4N | Fourth Pixel Negative LVDS differential data input. Channel 4 | |
| 39 | CH4_4P | Fourth Pixel Positive LVDS differential data input. Channel 4 | |
| 40 | N.C. | No Connection | (1) |
| 41 | N.C. | No Connection | |

**CNF2 Connector Pin Assignment (FI-RE51S-HF (JAE) or equivalent )**

| Pin | Name | Description | Note |
|---|---|---|---|
| 1 | N.C. | No Connection | (1) |
| 2 | N.C. | No Connection | |
| 3 | N.C. | No Connection | |
| 4 | N.C. | No Connection | |
| 5 | ODSEL | Overdrive Lookup Table Selection | (3) |
| 6 | N.C. | No Connection | (1) |
| 7 | SELLVDS | LVDS data format Selection | (2) |
| 8 | N.C. | No Connection | (1) |
| 9 | N.C. | No Connection | |
| 10 | N.C. | No Connection | |
| 11 | GND | Ground | |
| 12 | CH1_0N | First Pixel Negative LVDS differential data input. Channel 0 | (4) |
| 13 | CH1_0P | First Pixel Positive LVDS differential data input. Channel 0 | |
| 14 | CH1_1N | First Pixel Negative LVDS differential data input. Channel 1 | |
| 15 | CH1_1P | First Pixel Positive LVDS differential data input. Channel 1 | |
| 16 | CH1_2N | First Pixel Negative LVDS differential data input. Channel 2 | |
| 17 | CH1_2P | First Pixel Positive LVDS differential data input. Channel 2 | |
| 18 | GND | Ground | |
| 19 | CH1_CLKN | First Pixel Negative LVDS differential clock input. | |
| 20 | CH1_CLKP | First Pixel Positive LVDS differential clock input. | |
| 21 | GND | Ground | |
| 22 | CH1_3N | First Pixel Negative LVDS differential data input. Channel 3 | (4) |
| 23 | CH1_3P | First Pixel Positive LVDS differential data input. Channel 3 | |
| 24 | CH1_4N | First Pixel Negative LVDS differential data input. Channel 4 | |
| 25 | CH1_4P | First Pixel Positive LVDS differential data input. Channel 4 | |
| 26 | N.C. | No Connection | (1) |
| 27 | N.C. | No Connection | |
| 28 | CH2_0N | Second Pixel Negative LVDS differential data input. Channel 0 | (4) |
| 29 | CH2_0P | Second Pixel Positive LVDS differential data input. Channel 0 | |
| 30 | CH2_1N | Second Pixel Negative LVDS differential data input. Channel 1 | |
| 31 | CH2_1P | Second Pixel Positive LVDS differential data input. Channel 1 | |
| 32 | CH2_2N | Second Pixel Negative LVDS differential data input. Channel 2 | |
| 33 | CH2_2P | Second Pixel Positive LVDS differential data input. Channel 2 | |
| 34 | GND | Ground | |
| 35 | CH2_CLKN | Second Pixel Negative LVDS differential clock input. | |
| 36 | CH2_CLKP | Second Pixel Positive LVDS differential clock input. | |
| 37 | GND | Ground | |
| 38 | CH2_3N | Second Pixel Negative LVDS differential data input. Channel 3 | (4) |
| 39 | CH2_3P | Second Pixel Positive LVDS differential data input. Channel 3 | |

| | | | |
|---|---|---|---|
| 40 | CH2_4N | Second Pixel Negative LVDS differential data input. Channel 4 | |
| 41 | CH2_4P | Second Pixel Positive LVDS differential data input. Channel 4 | |
| 42 | N.C. | No Connection | (1) |
| 43 | N.C. | No Connection | |
| 44 | GND | Ground | |
| 45 | GND | Ground | |
| 46 | GND | Ground | |
| 47 | N.C. | No Connection | (1) |
| 48 | Vin | Power input (+12V) | |
| 49 | Vin | Power input (+12V) | |
| 50 | Vin | Power input (+12V) | |
| 51 | Vin | Power input (+12V) | |

Note (1) Please be reserved to open.

Note (2) Low or Open: VESA Format(default), connect to GND. High: JEIDA Format, connect to +3.3V.

Note (3) Overdrive lookup table selection. The overdrive lookup table should be selected in accordance with the frame rate to optimize image quality.

| ODSEL | Note |
|---|---|
| L | Lookup table was optimized for 60 Hz frame rate. |
| H | Lookup table was optimized for 50 Hz frame rate. |

Note (4) LVDS 4-Port Data Mapping

| Port | CH of LVDS | Data Stream |
|---|---|---|
| 1st Port | First pixel | 1, 5, 9, ....., 1913, 1917 |
| 2nd Port | Second pixel | 2, 6, 10, ....., 1914, 1918 |
| 3rd Port | Third pixel | 3, 7, 11, ....., 1915, 1919 |
| 4th Port | Fourth pixel | 4, 8, 12, ....., 1916, 1920 |

## 5.2 BACKLIGHT UNIT

The pin configuration for the housing and leader wire is shown in the table below.

CN2-CN7 (Housing): 51281-0994 (Molex) or equivalent

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VLED | Positive of LED String |
| 2 | VLED | |
| 3 | NC | No Connection |
| 4 | NC | |
| 5 | N1 | Negative of LED String |
| 6 | N2 | |
| 7 | N3 | |
| 8 | N4 | |
| 9 | N5 | |

Note (1) The backlight interface housing for high voltage side is a model 51281-0994, manufactured by Molex or equivalent. The mating header on converter part number is 51281-0994

### 5.3 CONVERTER UNIT

CN1(Header): CI0114M1HR0-LF (CvilLux) **or equivalent**

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VBL | +24V Power input |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | GND | Ground |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | STATUS | Normal (3.3V)<br>Abnormal (0V) |
| 12 | E_PWM | External PWM control signal |
| 13 | I_PWM | Internal PWM control signal |
| 14 | BLON | Backlight on/off control |

Notice:

#PIN 12:PWM Dimming Control (Use Pin 12) : Pin 13 must open.

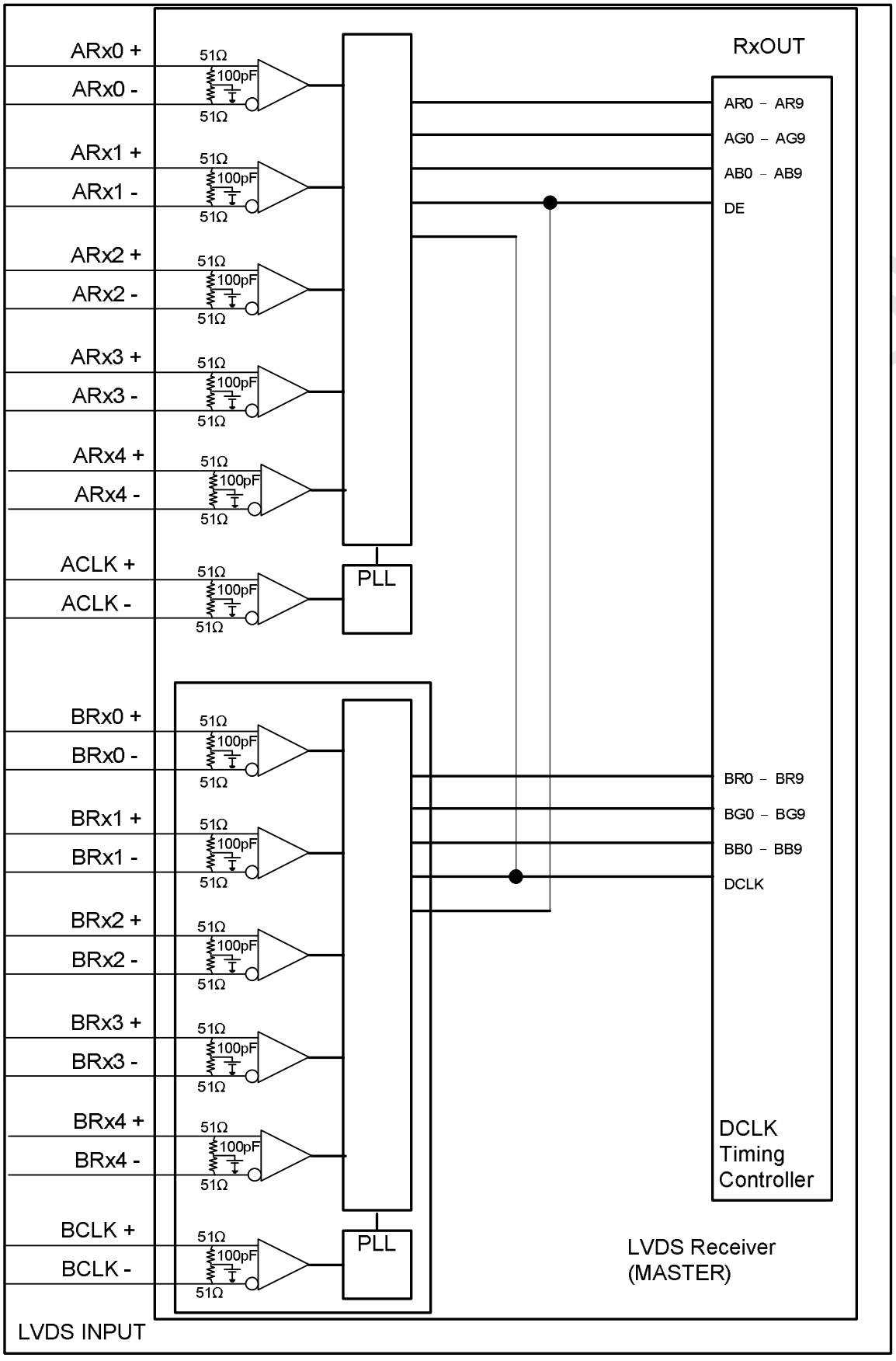
#PIN 13:Analog Dimming Control (Use Pin 13) : 0V~3.3V and Pin 12 must open.

#Pin 13(I_PWM) and Pin 12(E_PWM) can not open in same period.

CN2~CN7: 51281-1294 (Molex) or equivalent

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VLED | Positive of LED String |
| 2 | VLED | |
| 3 | NC | No Connection |
| 4 | NC | |
| 5 | N1 | Negative of LED String |
| 6 | N2 | |
| 7 | N3 | |
| 8 | N4 | |
| 9 | N5 | |

## 5.4 BLOCK DIAGRAM OF INTERFACE



**AR0~AR9: First pixel R data**

**AG0~AG9: First pixel G data**

**AB0~AB9: First pixel B data**

**BR0~BR9: Second pixel R data**

**BG0~BG9: Second pixel G data**

**BB0~BB9: Second pixel B data**

**DE: Data enable signal**

**DCLK: Data clock signal**

**The third and fourth pixel are followed the same rules.**

**CR0~CR9: Third pixel R data**

**CG0~CG9: Third pixel G data**

**CB0~CB9: Third pixel B data**

**DR0~DR9: Fourth pixel R data**

**DG0~DG9: Fourth pixel G data**

**DB0~DB9: Fourth pixel B data**

**Note (1) A ~ D channel are first, second, third and fourth pixel respectively.**

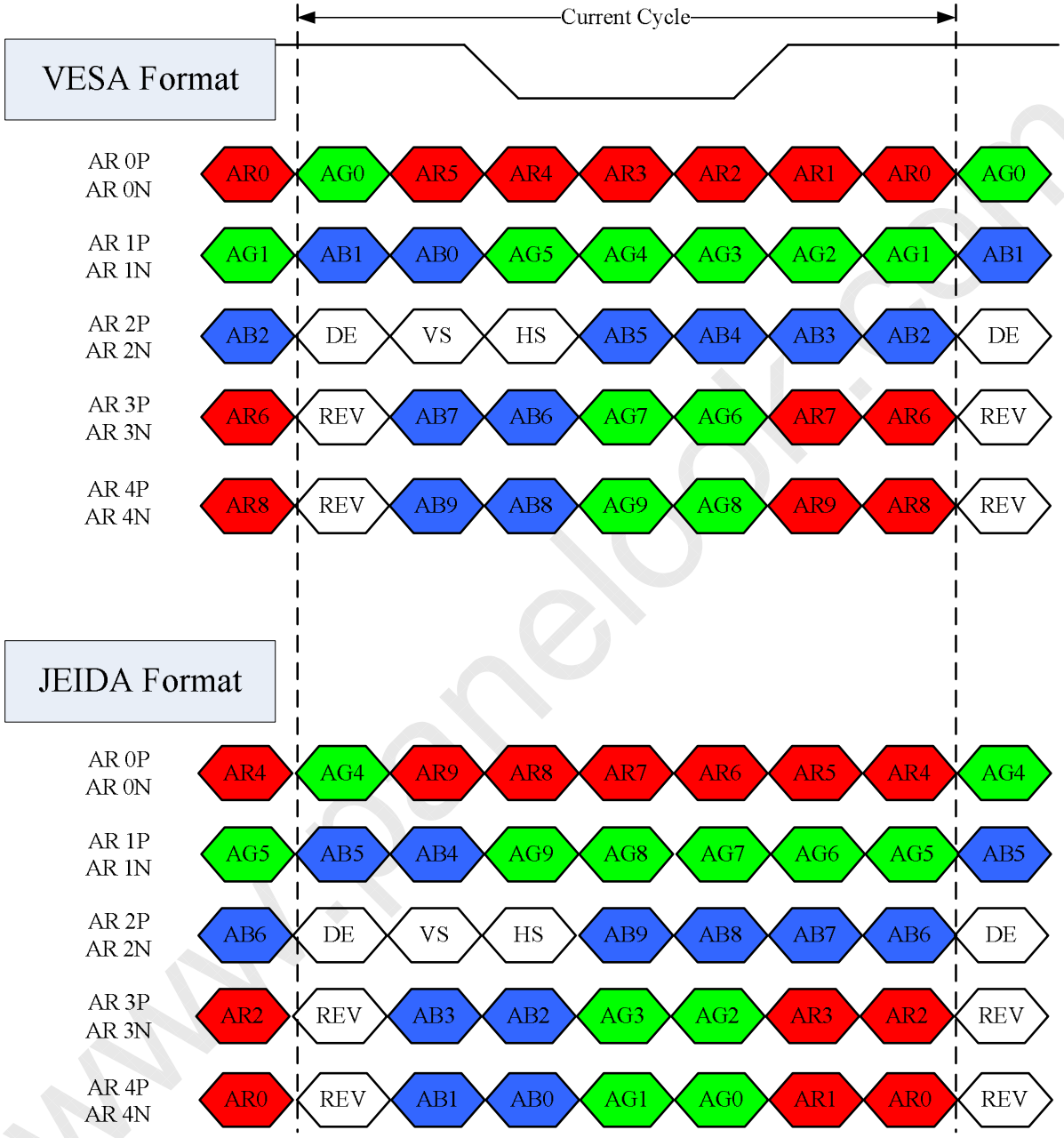
**Note (2) The system must have the transmitter to drive the module.**

**Note (3) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.**

### 5.5 LVDS INTERFACE

**VESA Format : SELLVDS = L or Open**

**JEIDA Format : SELLVDS = H**




AR0~AR9: First Pixel R Data (9; MSB, 0; LSB)

AG0~AG9: First Pixel G Data (9; MSB, 0; LSB)

AB0~AB9: First Pixel B Data (9; MSB, 0; LSB)

DE : Data enable signal

DCLK : Data clock signal

RSVD : Reserved

## 5.6 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 10-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of the color versus data input.

| Color | | Data Signal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | | | | | Green | | | | | | | | | | Blue | | | | | | | | | |
| | | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G9 | G8 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale Of Red | Red (0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red (1021) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (1022) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (1023) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Green | Green (0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green (1021) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (1022) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (1023) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Blue | Blue (0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue (1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue (2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue (1021) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue (1022) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue (1023) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Note (1) 0: Low Level Voltage, 1: High Level Voltage

# 6. INTERFACE TIMING

## 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

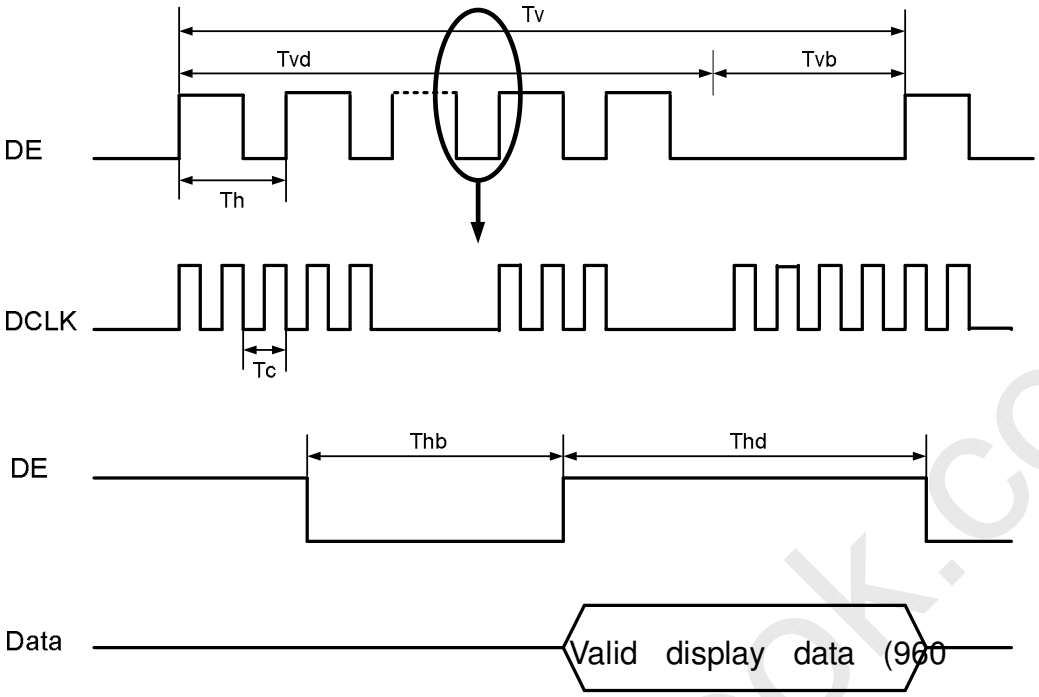
(Ta = 25 ± 2 ºC)

The input signal timing specifications are shown as the following table and timing diagram.

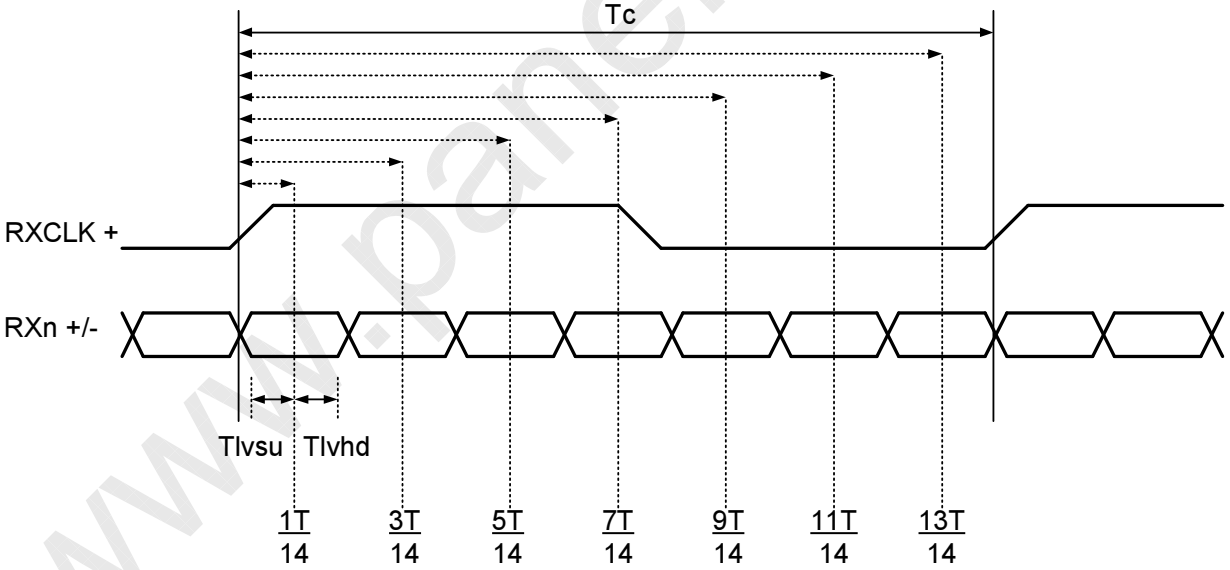
| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| LVDS Receiver Clock | Frequency | 1/Tc | 60 | 74.25 | 78 | MHz | - |
| | Input cycle to cycle jitter | Trcl | - | - | 200 | ps | - |
| LVDS Receiver Data | Setup Time | Tlvsu | 600 | - | - | ps | - |
| | Hold Time | Tlvhd | 600 | - | - | ps | - |
| Vertical Active Display Term | Frame Rate | | - | 120 | - | Hz | |
| | Total | Tv | 1115 | 1125 | 1135 | Th | Tv=Tvd+Tvb |
| | Display | Tvd | 1080 | 1080 | 1080 | Th | - |
| | Blank | Tvb | 35 | 45 | 55 | Th | - |
| Horizontal Active Display Term | Total | Th | 525 | 550 | 575 | Tc | Th=Thd+Thb |
| | Display | Thd | 480 | 480 | 480 | Tc | - |
| | Blank | Thb | 45 | 70 | 95 | Tc | - |

Note : Since the module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.

## INPUT SIGNAL TIMING DIAGRAM



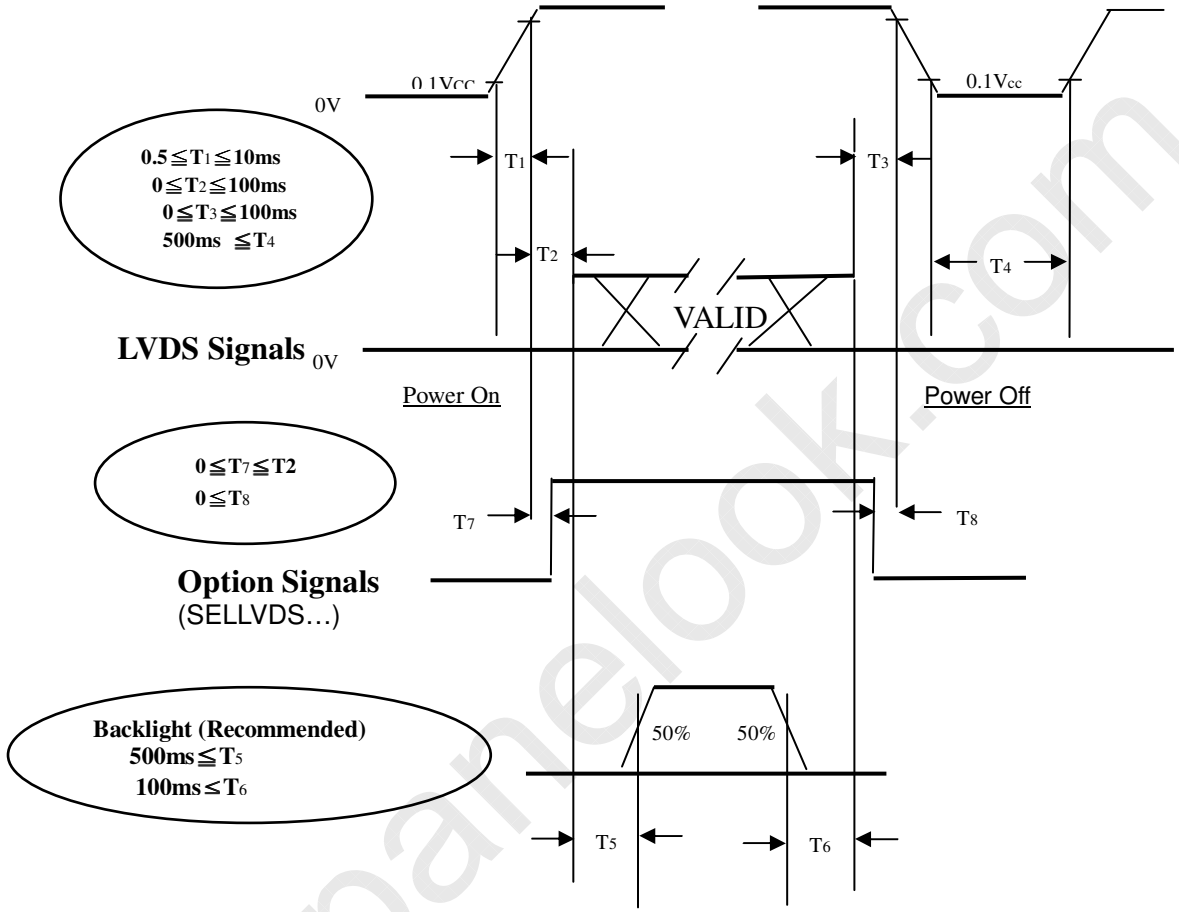

## LVDS INPUT INTERFACE TIMING DIAGRAM



## 6.2 POWER ON/OFF SEQUENCE

(Ta = 25 ± 2 ºC)

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should follow the diagram below.




**Power ON/OFF Sequence**

Note.

(1) The supply voltage of the external system for the module input should follow the definition of Vcc.

(2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

(3) In case of VCC is in off level, please keep the level of input signals on the low or high impedance. If T2<0, that maybe cause electrical overstress failures.

(4) T4 should be measured after the module has been fully discharged between power off and on period.

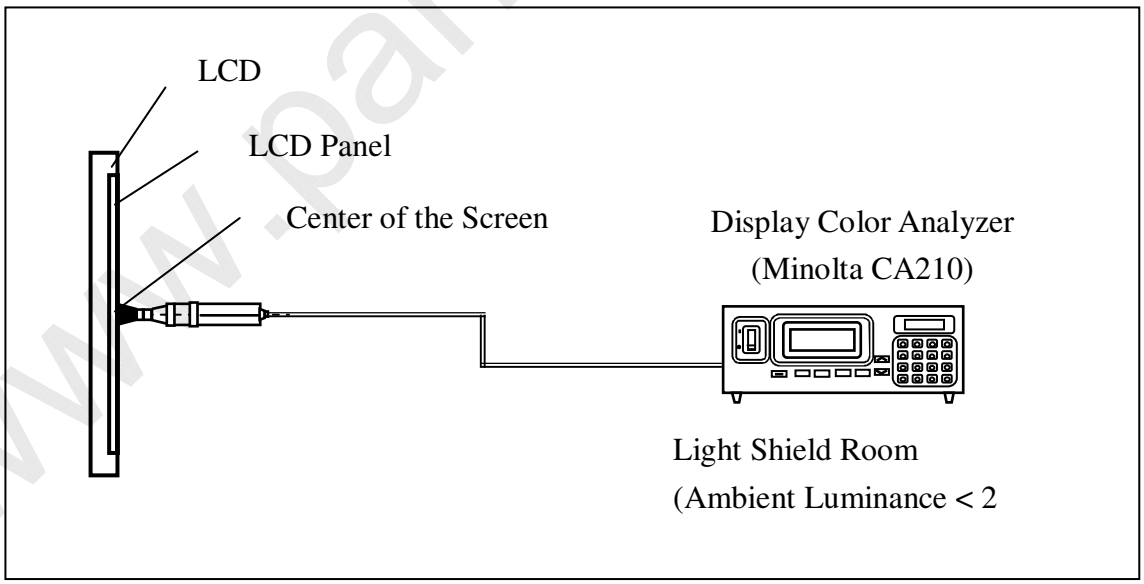
(5) Interface signal shall not be kept at high impedance when the power is on.

## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITIONS

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Ambient Temperature | Ta | 25±2 | oC |
| Ambient Humidity | Ha | 50±10 | %RH |
| Supply Voltage | VCC | 12 | V |
| Input Signal | According to typical value in "3. ELECTRICAL CHARACTERISTICS" | | |
| LED Current | IL | 60 | mA |
| Vertical Frame Rate | Fr | 60 | Hz |

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 1 hour in a windless room.



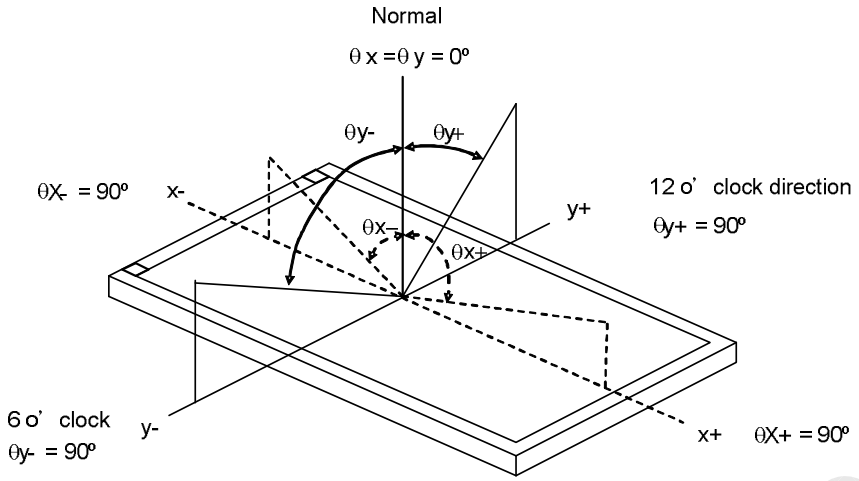
## 7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in 7.1.

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | θx=0°, θy =0° Viewing angle at normal direction | TBD | (4000) | - | - | Note (2) |
| Response Time | | Gray to gray | | - | (4.0) | (8.0) | ms | Note (3) |
| Center Luminance of White | | LC | | TBD | 450 | - | $cd/m^2$ | Note (4) |
| White Variation | | δW | | - | - | (1.3) | - | Note (6) |
| Cross Talk | | CT | | - | - | (4) | % | Note (5) |
| Color Chromaticity | Red | Rx | | TBD | (0.637) | TBD | - | - |
| | | Ry | | | (0.345) | | - | |
| | Green | Gx | | | (0.316) | | - | |
| | | Gy | | | (0.619) | | - | |
| | Blue | Bx | | | (0.153) | | - | |
| | | By | | | (0.054) | | - | |
| | White | Wx | | | (0.280) | | - | |
| | | Wy | | | (0.285) | | - | |
| | Color Gamut | C.G | | TBD | (72) | - | % | NTSC |
| Viewing Angle | Horizontal | θx+ | CR≥20 | 80 | 88 | - | Deg. | Note (1) |
| | | θx- | | 80 | 88 | - | | |
| | Vertical | θY+ | | 80 | 88 | - | | |
| | | θY- | | 80 | 88 | - | | |

Note (1) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by Eldim EZ-Contrast 160R



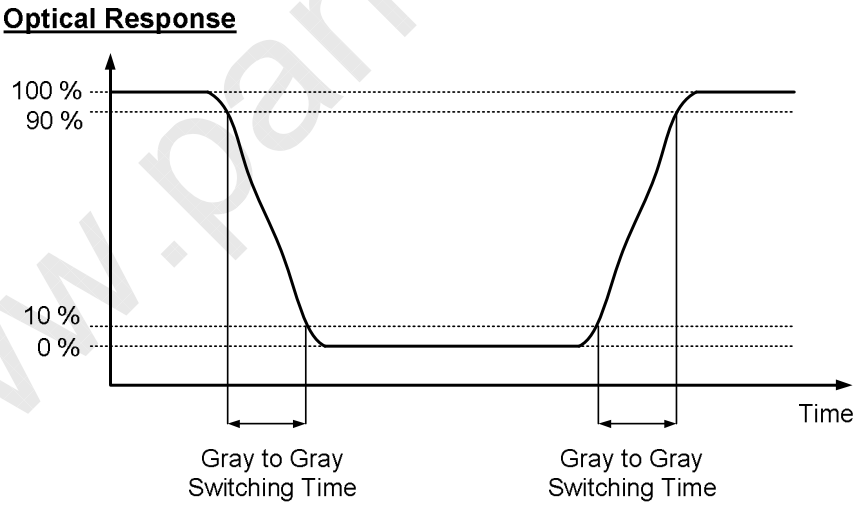

Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

Note (3) Definition of Gray-to-Gray Switching Time:




The driving signal means the signal of gray level 0, 63, 127,191,255.

Gray to gray average time means the average switching time of gray level 0, 63,127,191,255to each other.

Note (4) Definition of Luminance of White ($L_C$, $L_{AVE}$):

Measure the luminance of gray level 255 at center point and 5 points

$L_C$ = L (5), where L (X) is corresponding to the luminance of the point X at the figure in Note (6).

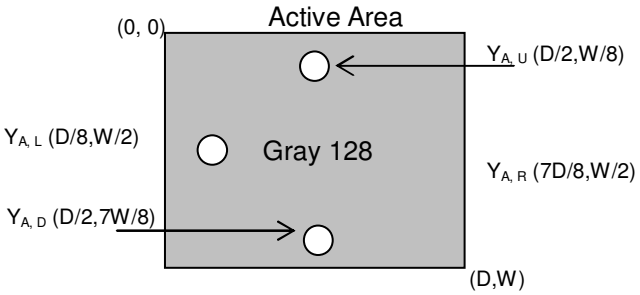
Note (5) Definition of Cross Talk (CT):

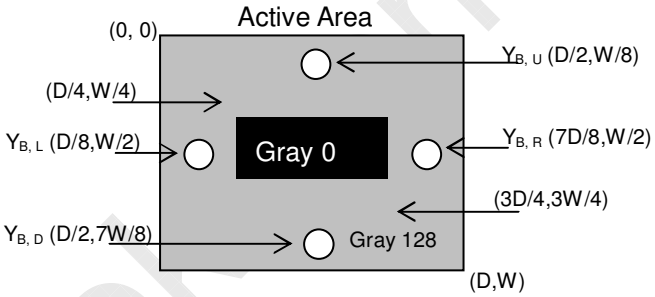
CT = | YB – YA | / YA × 100 (%)

Where:

YA = Luminance of measured location without gray level 0 pattern (cd/m2)

YB = Luminance of measured location with gray level 0 pattern (cd/m2)

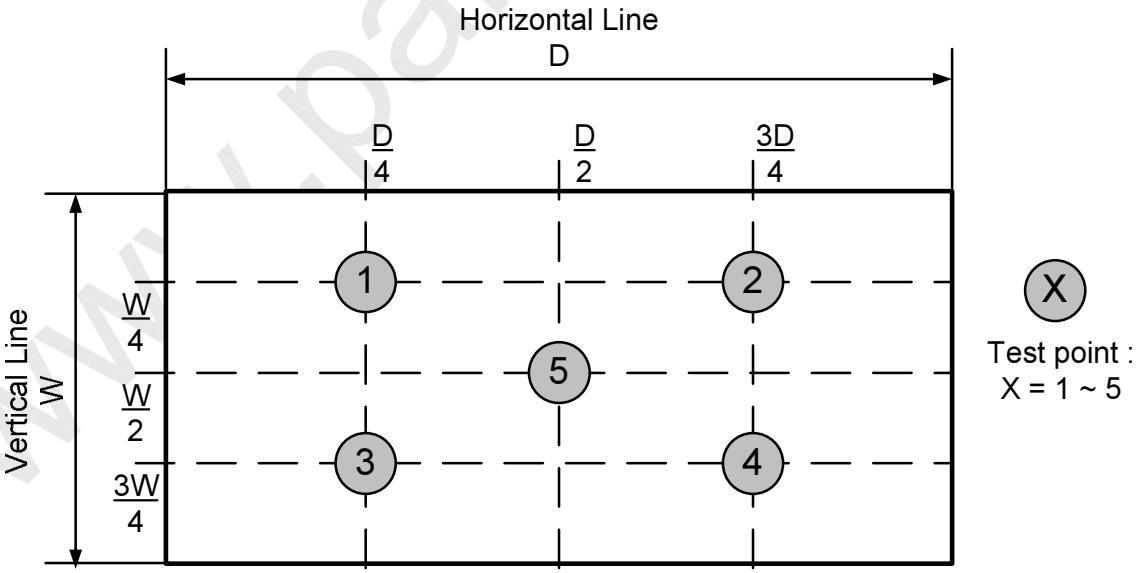



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

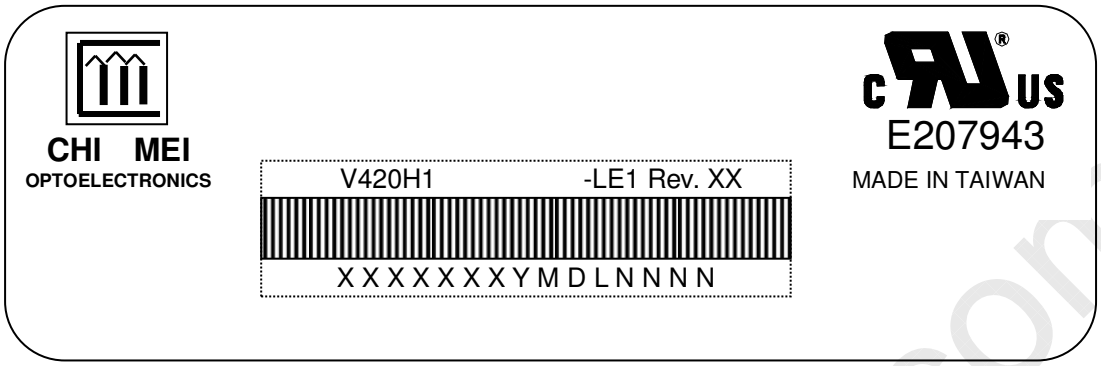
δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



# 8. DEFINITION OF LABELS

## 8.1 CMO MODULE LABEL

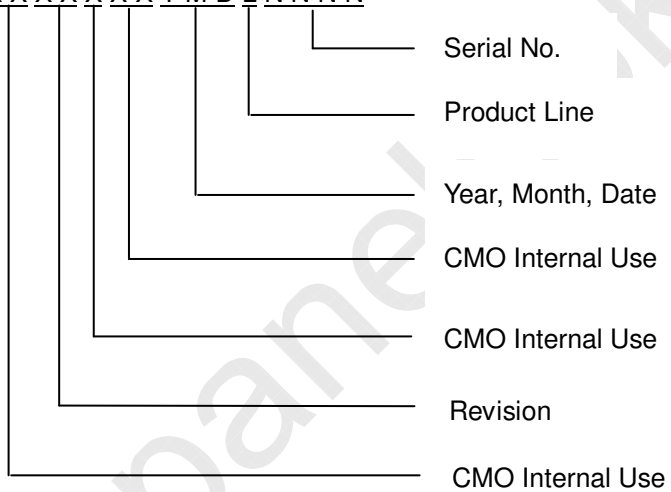
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.




(a) Model Name: V420H1-LE1

(b) Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

(c) Serial ID: X X X X X X X Y M D L N N N N




Serial ID includes the information as below:

(a) Manufactured Date: Year: 0~9, for 2000~2009

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I ,O, and U.

(b) Revision Code: Cover all the change

(c) Serial No.: Manufacturing sequence of product

(d) Product Line: 1 -> Line1, 2 -> Line 2, …etc.

# 9. PACKAGING

## 9.1 PACKING SPECIFICATIONS

(1) 5 LCD TV modules / 1 Box

(2) Box dimensions : 1085(L)x296(W)x653(H)mm

(3) Weight : Approx. 47.35Kg(5 modules per carton)

## 9.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

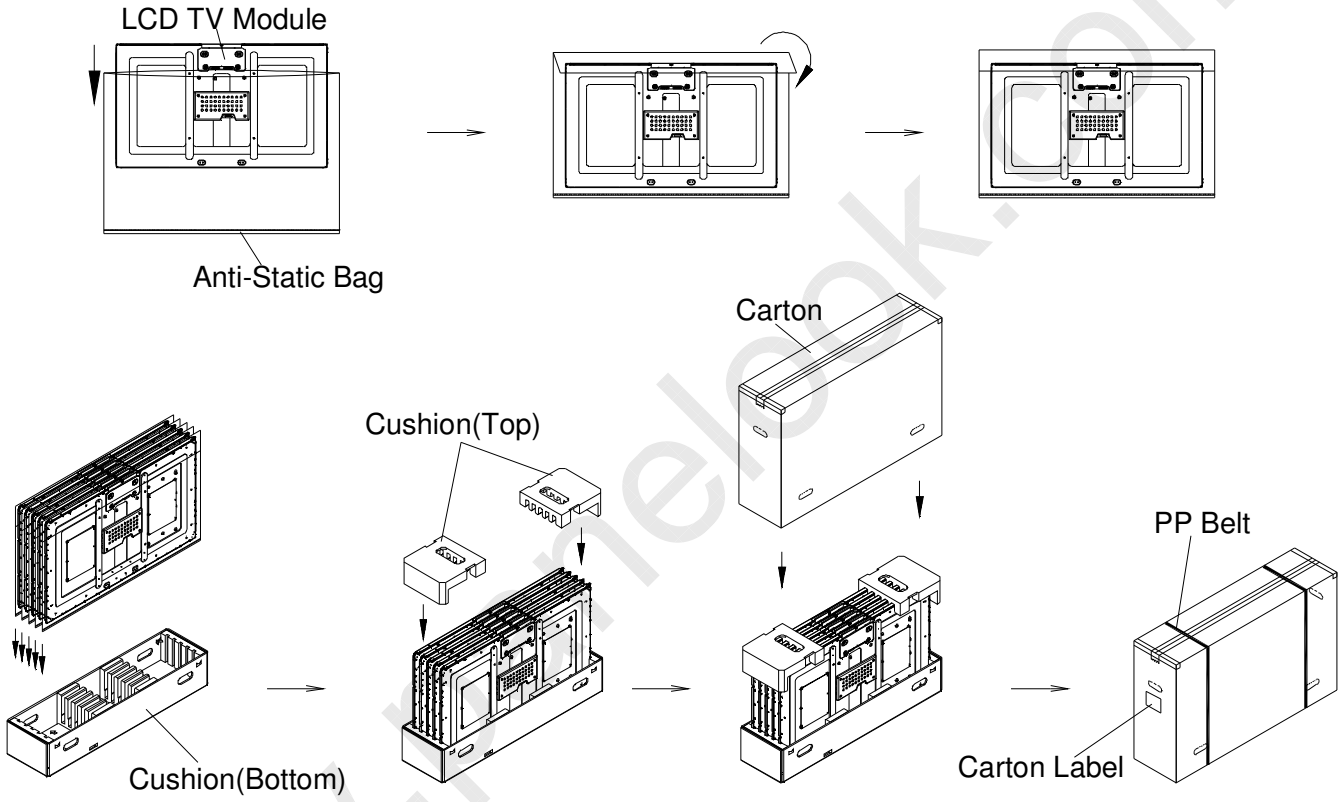
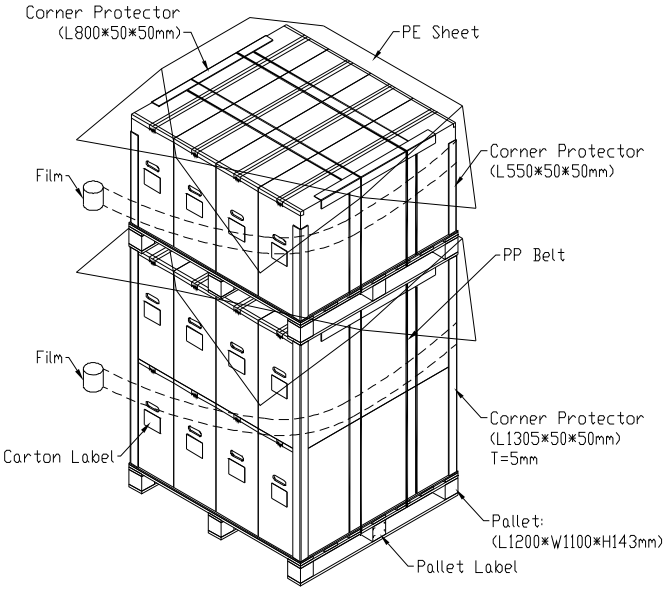



Figure.9-1 packing method

Sea / Land Transportation
(40ft Container)

Air Transportation



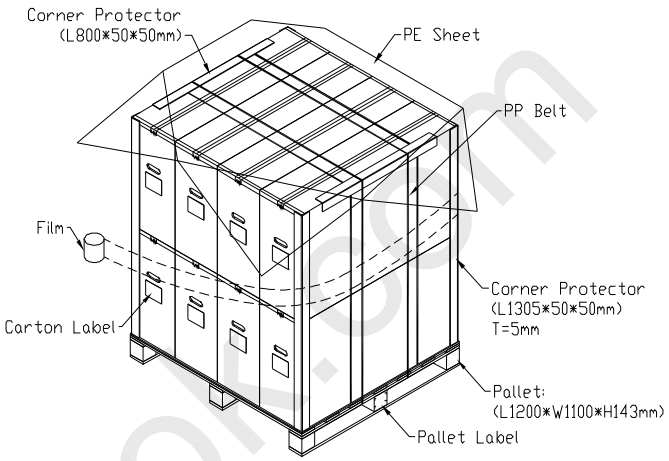




Figure.9-2 packing method

# 10. PRECAUTIONS

## 10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and backlight.

(4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

(5) Do not plug in or pull out the I/F connector while the module is in operation.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) Moisture can easily penetrate into LCD module and may cause the damage during operation.

(9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.

(10) When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of LED light bar will be higher than that of room temperature.

## 10.2 SAFETY PRECAUTIONS

(1) The startup voltage of a backlight is over 1000 Volts. It may cause an electrical shock while assembling with the converter. Do not disassemble the module or insert anything into the backlight unit.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(3) After the module's end of life, it is not harmful in case of normal operation and storage.

## 11. MECHANICAL CHARACTERISTICS